A New Species of the Genus *Badistica* Karsch, 1891 from West Africa

(Orth. Acridoidea)

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The genus *Badistica* Karsch occupies an important place in the grasshopper fauna of the forests of West Africa since it appears to be a genus endemic to areas from Cameroons westwards. *B. bellula* Karsch (Cameroons) and *B. simpsoni* Ramme (W. Ivory Coast and westwards) are closely related species found at oposite ends of West Africa, separated zoogeographically by the Niger to eastern Ivory Coast corridor. This forest corridor is occupied by two known species, *B. ornata* I. Bol. (Sierra Leone — Ghana west of Volta river), and *B. lauta* Karsch originally described from the upland relict forests of the Missahohe area of Togoland. It is to the last species that the new species is most closely allied.

While collecting in West Africa a series of 26 specimens of the little studied *B. lauta* were collected from localities ranging from Liberia to the Volta region of Ghana, not far from the type locality. A superficial examination revealed an array of colour variants, and male genitalia were not examined initially because the external facies of the males were very similar. A recent study of the male genitalia however revealed the presence of three species.

DESCRIPTION OF SPECIES.

Badistica margarita sp. nov.

Males.—Eyes large and protruding, vertex very narrow dorsally so that eyes are separated by a distance equal to width of antennal socket. Top of head blue-green behind narrowest part of vertex, with two blakkish stripes expanding posteriorly and passing diagonally downwards to back of head. Genae, frons, upper part of clypeus, upper part of labrum and first antennal segment yellow. Also with yellow stripe passing about halfway upwards behind eye. Mandibles greenish, bluish towards tip and anterior edge. Tips of maxillae and labrum blackish. Eyes in life red, in museum material eyes of males light red brown. Antennae light blue or greenish basally, darkening apically with terminal segments reddish.

Pronotum dull blackish green, lighter yellowish in first and fourth pronotal sulci. Prosternal tubercle slender, erect, and acutely pointed. Thorax ventrally dark blue green, laterally and dorsally blue black, with episternum 3 bearing a large creamy white spot.

Tegmina greenish black or black above but black at costal border, and with apices reaching or falling just short of posterior edge of tergite 1 of abdomen. Tympanum developed.

Abdominal segments 1-4 dark blue green above, tergite 1 bearing a pair of pinkish or pearly white squarish spots, separated from each other by a distance equal to or just less than dorsal interocular distance. Tergites 5 onwards yellowish (male paratype discoloured). Supra-anal plate buff with greenish markings, sub-genital plate green. Cerci flattened, tapered, with a slender apical spine; length to depth ratio 2.2-2.3. Cerci yellowish proximally, distally dark green.

Fore and mid femora yellow, latter being greenish distally. Mid and fore tibia greenish. Posterior femora yellow dorsally and on each side with a black band extending from lower outer carina to lower inner carina over dorsal surface of femur about 2/5 from base of femur, and another black band about 2/5 of way from distal end completely encircling femur just anterior to its narrowest part. Femur distal to second black band, dark green on outer side, dark blue on inner side. Knee lunules red brown, outer and inner lower apical lobes being pointed apically and pigmented with a vertical whitish or yellowish stripe. Lower surface of femur blue, as is upper surface of knee (second male paratype discoloured, red pigmentation here due to moisture). Posterior tibiae brightly coloured blue with spines (7 or 8 outer, 10 inner) coloured as in female.

Epiphallus (fig. 1 B) with well developed ancorae and reduced lophi. Lophi however developed into two outwardly directed hook-like structures, differing in this respect from those of next two species. Penis apex (fig. 1 A) with broadly auricular, bluntly tipped valves, cingular valve being enveloped in membrane. In this respect cingular valve differs from that in *B. lauta* Karsch in which cingular valve is exposed. Differs from *B. fascipes* in that penis valves are not pointed and inwardly orientated apically.

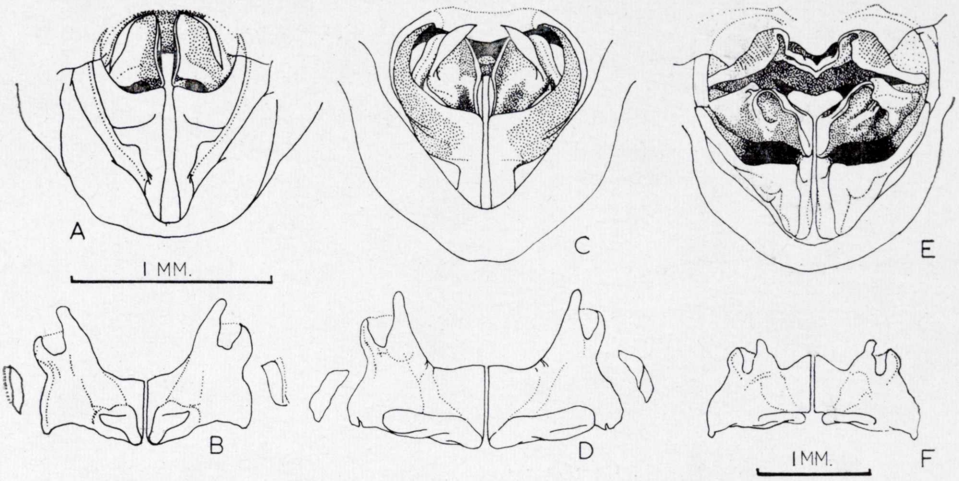

Fig. 1.—A) Penis apex of *Badistica margarita* sp. nov.; B) Epiphallus of *Badistica margarita* sp. nov.; C) Penis apex of *Badistica fascipes* Chopard; D) Ephiphallus of *Badistica fascipes* Chopard; E) Penis apex of *Badistica lauta* Karsch; F) Epiphallus of *Badistica lauta* Karsch. Upper scale refers to A. C. E.; lower scale to B, D, F.

Note that cercus proportions are near to those of *B. fascipes* viz. 2.2-2.3 length to maximum depth ratio.

Female.—Head entirely light green with pale yellow line in front of eyes. Mandibles at anterior edge and labrum blue, latter with tip black. Antennae shorter than head and pronotum, with basal part blue and rest blackish. Pronotum light green with black spot at lateral anterior corner of each pronotal lobe at lowest extremity of first pronotal sulcus. Pronotum rounded above without median or lateral carinae. Thorax tegmina and abdomen uniform light green with abdominal sternites and ovipositor valves bluish. Tegminal apices reaching to posterior edge of first abdominal tergite. Fore and mid femora orange except at extreme tips where they are pigmented with green. Fore and mid tibiae green. Posterior femora light green above and outer side; slightly yellow on lower edge of outer area. Inner surface yellow to yellow-green. Apically and below posterior femora blue, with knee lunules red-brown. Posterior tibiae blue except at base where greenish blue, with suggestion of a yellowish annulus 2 mm. from proximal end. 8 outer and 10 inner tibial spines. Inner spines black, outer spines white with black tips.

Measurements	*Males*	*Female*
Head width	(2) 4.2- 4.3, 4.25;	(1) 4.9
Posterior femur length	(2) 12.4-12.5, 12.45;	(1) 14.0
Tegminal length	(2) 3.2- 3.8, 3.50;	(1) 4.0
Length frons to tips of folded posterior femora	(2) 22.2-23.1, 22. 6;	(1) 25.2

Material.—Holotype ♂ : Ghana, Western region, Princes Town, 2. xii.61. Paratypes: 1 ♀, same data as holotype; 1 ♂, Ghana, Western region, 6 mls. N.E. of Princes Town (8-9).vi.61.

Badistica fascipes Chopard, 1958.

Male.—Only the female holotype was described by Chorpard. The males are therefore described below.

Form of vertex as in last species. Vertex blue green above a pair of dark brown stripes passing backwards diagonally terminating at posterior edge of genae. Yellow colouration around entire posterior margin of eyes. Antennae and remainder of head coloured as in last species, except that each mandible has a brown spot on its outer surface. Compound eyes in life purplish black, brown in dead specimen.

Pronotum light orange-yellow with marginal black spots on posterior edge. Prosternal tubercle acutely pointed and tapered. Thorax ventrally rich green laterally, yellowish on mid line. Episternum 2 blue-green with black distal part, epimeron 2 shiny black and conspicuously punctate, episternum 3 with upper 3/5 bright yellow and apically black, epimeron 3 black. Tegmina black with brownish transluscence. Dorsal part of thoracic segment 3 dark green medially, black laterally. Abdominal segment 1 black, almost entirely filled by two square yellow spots which are separated by a very narrow line of black dorsally. Tympanum developed, covered by tegmina whose apices extend to posterior edge of abdominal tergite 1. Abdominal tergites 2-4 black with traces of yellow on mid dorsal line. Abdominal sternites bluish anteriorly. Rest of abdomen yellow. Cerci dull yellow green, with inner side and tips black. Length to depth ratio 2.25.

Form and colouration of posterior femora as in previous species but lower lateral apical lobes lacking vertical whitish or yellowish stripe. Posterior tibiae bright blue with a lighter annulus basally which is white on its inner side and externally yellow; spines (7 in outer row, 10 in inner row) coloured as in previous species. All tarsi, fore and mid tibiae and tips of fore and mid femora green. Basal half of fore and mid femora orange-yellow.

Male epiphallus (fig. 1 D) with large erect ancorae; less divergent than in *B. margarita*. Anterior projections pointed, well developed, but posterior projections — as in *B. margarita* — weak (for terminology see Dirsh, 1956). Lophi however forming broad rounded lobes lying perpendicular to body of epiphallus. Each penis valve with pointed apex which is turned towards mid-line. Cingular valve enveloped in membrane, less so than in *B. margarita* but not free as in *B. lauta* Karsch (fig. 1 C).

Measurements	*Males*
Head width (3)	4.4- 4.8, 4.47
Posterior femur length (3)	12.0-13.0, 12.40
Tegminal length (3)	3.5- 3.99, 3.73
Length frons to tips of folded posterior femora (3)	22.2-24.0, 22.93

Material.—1 ♂ : Liberia, N. of Monrovia, Bomi Hills, 5 mls. N.E. of mines nr. forest rest ho., 23.vii.63. 1 ♂ (Topotype) Guinea Rep., Nimba, Forêt de Nion, camp 4, 1000 m., 7.iv.1942 (M. Lamotte); 1 ♂ (Topotype) as previous specimen but 11.vi.1962; 1 ♀ Guinea Rep., Col. de Seredou, W. of Irié (14-16), vii.63 (N. D. Jago).

Discussion.—In 1958, Chopard described *B. fascipes* from female material collected in the forests of Nimba Mt. in Guinea. Dirsh in 1963 pointed out that this females was close to Karsch's description of the allotype of *B. lauta* and accordingly synonymised it with *B. lauta*. An examination of fuller representative material, both of *B. fascipes* and *B. lauta* (including male paratype material of *B. lauta* lent very kindly by Dr. K. K. Günther of the Zoologisches Museum of the Humboldt Universität, East Berlin) shows that *B. fascipes* is a good species, apparently separated zoogeographically from *B. lauta* by its adaptation to higher altitudes in the central Guinea and Nimba areas. *B. lauta* is known from north-west Ivory Coast east of the Zo river and also from the extreme east of Liberia (see data under *B. lauta*).

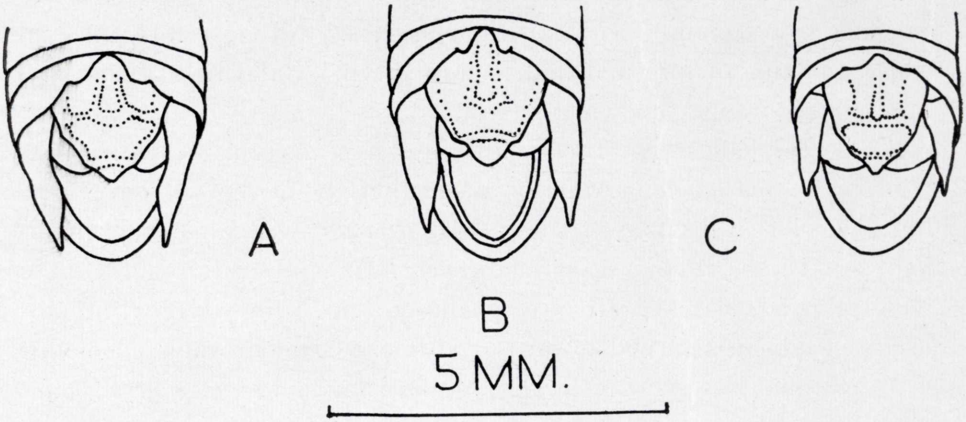

Fig. 2.—Abdominal apices of males in genus *Badistica* seen from directly above supra-anal plate: A) *B. Margarita;* B) *B. fascipes;* C) *B. lauta.* Note differences in cerci, last abdominal tergite, and ridges on supra-anal plate.

In spite of dark forms of the female in *B. lauta* occurring in both Togoland and north-west Ivory Coast, the form of *B. fascipes* represented in the female holotype is characteristic of *B. fascipes* and never as fully expressed in *B. lauta.* The male genitalia of *B. lauta* are sufficiently different from those of *B. fascipes* to indicate isolation and evolutionary divergence to species level. A similar divergence is also to be noted in the form of the supra-anal plate and cerci of the male (see fig. 2. A, B, C).

Badistica lauta Karsch, 1896.

A redescription is given here in the light of the new species descriptions.

Males.—Form of eyes and vertex as in first species. Whole of head bright yellow (with this colour surrounding each compound eye), except top of vertex which is blue-green medially with a diverging pair of light brown lines passing back to occiput but not extending laterally into each gena. Clypeus and labrum brownish laterally, latter black at tip. Mandibles yellow, blue grey apically and along anterior edge with grey, brown or greenish spot in centre of outer face. Segments 1 and 2 of antennae yellow, basal third of flagellum blue, rest blackish. Eyes in life dull red brown (Asankrangwa — Enchi specimens), or red, fading to dull brown in dried material. (It is possible that eyes are subject to colour change in live males and females, since a colour transparency of a male without data a attached shows the eyes to have a distinctly bluish cast.)

Pronotum dull orange, finely punctured. Prosternal tubercle erect, pointed apically and conical. Third thoracic segment blue-black above. Tegmina dull red-brown to blackish brown, their tips falling just short of to just surpassing posterior edge of first abdominal tergite. Episternum 2 blue-green with a yellowish transverse spot near its ventral end. Episternum 2 black to reddish. Episternum 3 apically dark blue-green with upper 3/4 yellow. Epimeron 3 black. Underside of thorax probably yellowish (faded in this material).

Abdomen blue-green below, tergites 1-3 black, tergite one having a pair of squarish yellow spots, not sharply separated from each other by black pigment but separated instead by a difuse brown line. Segments 4 onwards showing more and more yellow pigmentation. Sub-genital plate yellow-green. Cerci black apically, outer surface yellow, inner surface often blackish. Not as greatly flattened as *B. margarita* or *B. fascipes,* length to greatest depth being about 2.5.

Fore and mid legs with femora yellow, tipped with green, and tibiae yellow-green. Posterior femora as those for *B. margarita* but anterior black band extends only part of way down inner side of femur and colouration of knees rather different. Knee lunules bright vermilion red, bordered above with yellow. Lower apical lobes mainly yellow with dark green preapical spot.

Pigmentation between second black femoral band and knee very dark so that black pigment merges into dark green area without any boundary. Posterior tibiae dark blackish blue with a yellow annulus about 2 mm. from base. Outer row of spines showing very little white pigment, tips black. Inner row of spines black (8 or 9 outer spines, 10 inner spines). Tarsi reddish.

Epiphallus (fig. 1 E) with short decurved ancorae, which are flattened apically and sharply pointed. Lophi smaller than in *B. fascipes* but of a similar rounded lobate shape and orientation. Penis apex very large, with rugose cingular valve exposed and free of any membranous covering. Penis valve apices small and tightly auricular (fig. 1 E).

Females.—Very similar to *B. margarita* but differing in following respects in majority of material:

(a) Pronotum not uniform green but with all specimens showing dull orange suffusion, especially at sides. No black markings laterally.
(b) Vertex uniform green, or more usually darker green with flanking diverging bands of brown pigment.
(c) Eyes in life very in colour from dull maroon (Asankrangwa) to dark milky blue-grey.
(d) Lamrum tending to blackish rather than blue apically.
(e) Meso and metathorax and abdomen green above, dorsally often conscipicuosly darker than laterally. Tegmina green, blackish towards costal border and apex. Ovipositor valves brownish. Ventral surface of thorax and abdomen dark blue-green.
(f) Basal 3/5 to 3/4 of fore and mid femora orange or yellow. Tibiae green, tarsi bluish.
(g) Posterior femora yellow internally and on lower half of outer side, without black bands of any kind on outer or inner side. Dark green above and blue-green both below and on outer side of narrowest part in front of knee. Inner side of narrowest part black. Knee lunules red. Posterior tibiae bright prussian blue except at base where dark blue-green. 8 outer black tipped white spines, 10 inner black spines.

The above applies to the majority of the material. However the females from Ivory Coast differ in the following respects:

Females from Banco and Yapo forest have a pronotum which is uniform yellow-green or dark green. In this respect therefore they more closely resemble the female of *B. margarita.* A male from Banco forest is however clearly a specimen of *B. lauta.* Note however that one of the females from Yapo forest is unique, in having traces of the development of a dark posterior femoral fascia, like those in the ♀ type of *B. fascipes,* the female cotypes of *B. lauta* also fitting the description of *B. fascipes.* These fascia are dark green, not black as they are in the males of all three species, and in the females of *B. lauta* from Togoland and *B. fascipes* which bear this 'male' colour pattern on their posterior femora. This shows that intermediate development of these fascia is possible. Males of *B. lauta* caught not far from the type locality have lighter brownish posterior femoral markings like the lectotype.

The female from the Zo river area of north-west Ivory Coast is unique in the material examined in not only having a uniform green pronotum (like *margarita*), but an orange pigmentation of the basal half of the posterior femora. This may however be a post-mortem change. The femora lack any black fascia and the female is associated with a male definitely identified as *B. lauta* Karsch.

Measurements	*Males*	*Females*
Head width	(11) 4.1- 4.6, 4.35:	(14) 4.8- 5.6, 5.13
Posterior femur length	(11) 11.5-12.9, 12.50:	(14) 13.8-16.8, 14.83
Tegminal length	(11) 3.1- 3.8, 3.40:	(14) 3.2- 4.5, 3.91
Length frons to tips of folded posterior femora	(11) 21.0-23.8, 22.60:	(14) 24.5-30.4, 27.23

Material.—1 ♂ (cotype), Togoland, Missahohé, 30.iv.1894 (Baumann); Ghana, 1 ♂, Eastern reg., Pusa Pusa R., Atewa range, vi.63; 1 ♀, Eastern reg., Begoro, vi.59; 2 ♂♂, Eastern reg., S. Akim Abuakwa, Essuboni For, res., 18.ii.62; 1 ♀, Ashanti reg., N. Formangsu For. res., 8.viii.62; 1 ♀ (nymph), Western reg., 16.ml. N. of Cape Coast, Jukwa, 17.x.59; 1 ♂, Western reg., 5 mls. W. of Tano R. ferry, Asankrangwa-Enchi rd., 12.vii.62; 1 ♂, 3 ♀♀ (and 1 ♂, 1 ♀, nymph), same locality but (24-25).ix.62; 1 ♂, 1 ♀, Western reg., 2 mls. E. of Tano R. ferry, Asankrangwa-Enchi rd., 24.ix.62; 1 ♂, 1 ♀ (both nymphs), Volta reg., 0°39'E, 8°17'N, 2 mls. E. of Chiare, 23.xii.62; 1 ♂, Ashanti reg., Bobiri For. res., 23 mls. E. of Kumasi, nr. forest bungalows, ix.1958 (J. Taylor, Imp. Coll. Ghana Expdn. 1958). Togoland: 1 ♀ (nymph), 0°37'E, 8°12'N, 7 mls. E. of Dadieso, nr. Dikpeleon, 24.xii.62. Ivory Coast: 1 ♂, 1 ♀, Man-Danane rd., 10 mls. W. of Zo R. bridge, 13.vii.63; 4 ♀♀, Reserve du Banco, ii.1950 (Holas); 1 ♀, Fôret de Yapo, 10.iii.1951 (Holas); 1 ♂ Reserve du Banco, — (R. Paulian and G. Delamare). Liberia: 1 ♂, btwn. Sinlitro and Diyala, 1948 (Hoylas and Dekeyser).

Discussion.—Without doubt, on the evidence of male material, *B. lauta* extends from E. Liberia to Ghana and Togoland east of the Volta river. The females are much more varied in their colouration than the males, in the montane areas of Ivory Coast and Togoland apparently showing an affinity in having male type colouration. Lowland material from Ivory Coast and from Ghana, shows marked sexual dichromatism with one female from Yapo forest, Ivory Coast, showing traces of male colouration on the posterior femora. On the basis of male genitalia this material definitely belongs to one species, *B. lauta* Karsch. Note that *B. ornata* shows great variability in femoral colouration with varying degrees of development of the black fascia in the posterior femora, though in this species the spot may be missing in either sex.

The curious distribution of the new species and *B. fascipes,* situated as they are in or inland isolated hilly forest areas in low lying country near the coast, is strongly suggestive of these areas having once been relict forest nuclei at times when the savannah was far more extensive than it is at present. The lesser sexual dichromatism in *B. lauta* populations from the N. W. Ivory Coast and Togoland (Missahohé) areas is suggestive of their former continuity in pluvial times and their enforced isolation at others, with pockets of the same species surviving in between. Continuity has now been restored, but in so doing a form with marked sexual dichromatism has evolved in the greater part of the lowland semideciduous and rain forest populations.

Acknowledgements.

Dr. K. K. Günther of the Zoologisches Museum of the Humboldt Universität, East Berlin, very kindly loaned a male cotype of *B. lauta* Karsch which I here designate the lectotype for the species. I also wish to thank Monsieur R. Roy at I. F. A. N. Dakar (who very kindly arranged for the loan of *B. lauta* material — 5 females from Ivory Coast and a male from Liberia), and Monsieur M. Descamps who loaned material from the Museum National d'Histoire Naturelle, Paris (including topotypical male material of *B. fascipes).*

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